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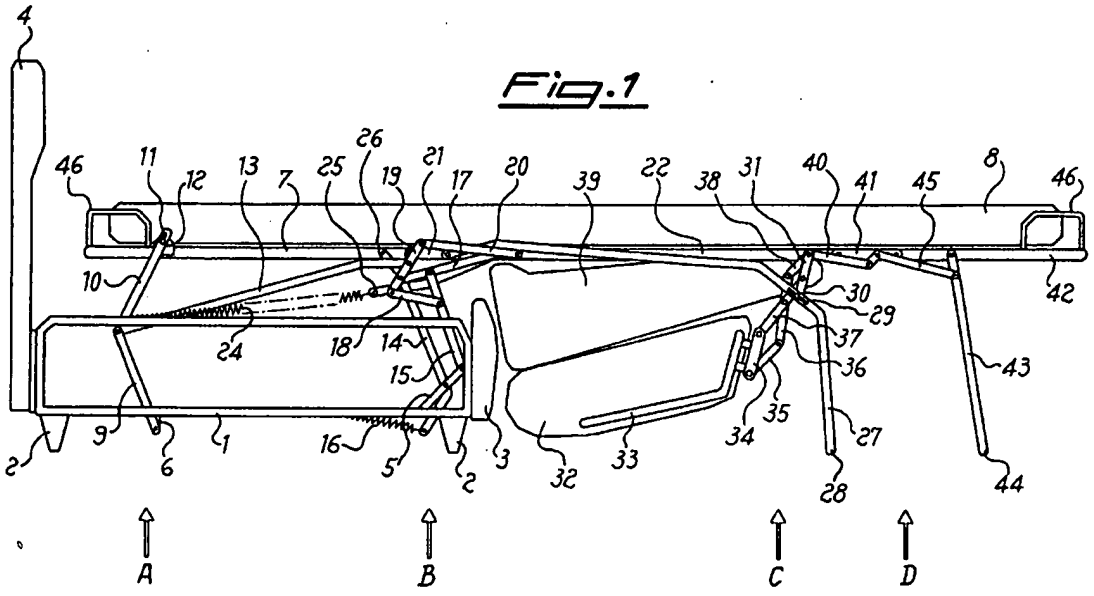
(54) Mechanism for sofa-beds and the like

(57) A mechanism for sofa-beds and the like comprising at least a back (32) and a seat (39), said mechanism comprising a bedspring capable of supporting at least a mattress (8), is divided into several sections (7, 21, 22, 41 and 42) hinged to one another and is foldable under the seat (39), and a plurality of lever systems (A, B and C) capable of lifting and extending such a bedspring, as well as folding the seat (39) and the back (32) under at least one of said sections (22) of the bedspring. The present invention further relates to a chair-bed and a sofa-bed comprising such a mechanism.

Fig.1



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Description

The present invention relates to a mechanism for sofa-beds and the like, which is capable of extending and lifting a mattress supporting bedspring divided into several sections hinged to one another. The present invention further relates to a chair-bed and a sofa-bed comprising such a mechanism.

It is known that some kinds of opening mechanisms for sofa-beds or chair-beds comprise a bedspring divided into several sections hinged to one another, which may be lifted and longitudinally extended towards the front side of the sofa-or chair-bed by means of suitable lever systems. In such known mechanisms, when the bedspring is folded, also the bed mattress is folded under the seat of the sofa- or chair-bed so that neither such a seat nor the back are part of the mattress itself. By this arrangement, both the aesthetics and the comfort of the sofa- or chair-bed are obviously improved, since the seat and the back thereof may have different shape, fabric and springs with respect to the mattress.

However, since a sofa-bed is about 80 cm long and has its seat about 45 cm above the ground, such a mattress must be lower and/or shorter than a standard sized mattress, which is about 190 cm long and about 12 cm high.

As a matter of fact, should a standard mattress be folded in two, it would fill up at least a 110 cm long space, resulting in the increase of the size of the sofa-bed in which it is arranged. Should instead the mattress be folded in three or more parts, it would fill up at least a 50 cm high space, and thus the seat would be too high.

The object of the present invention is thus to provide a mechanism free from such a drawback, i.e. a mechanism capable of housing a standard or even larger sized mattress under a seat anyway having a small size. Such an object is achieved by a mechanism having its main features specified in claim 1.

Thanks to the particular control lever system and the particular arrangement of the bedspring sections of the mechanism according to the present invention, it is possible not only to fold in several points a standard or even larger sized mattress (e.g. a mattress 2 meters long), but also to effectively compress it so that its overall dimensions do not exceed the normal size of a sofa-bed or a chair-bed.

Another advantage of the mechanism according to the present invention is due to the fact that, when the bedspring is folded, at least one of such control lever systems prevents the expansion forces of the compressed mattress from reopening the bedspring.

A further advantage of the mechanism according to the present invention is due to the fact that, when the bedspring is open, both the seat and the back are hidden under a middle section of such a bedspring, resulting in an improvement of the aesthetics ofthe sofa-bed or chair-bed in the open position, i.e. in the night-time position.

Further advantages and features of the mechanism according to the present invention will be evident to those skilled in the art from the following detailed description of an embodiment thereof, with reference to the attached drawings, wherein:

- Figure 1 shows a side view of a sofa-bed comprising the mechanism according to the present invention in open position, i.e. in the night-time position;
- Figure 2 shows a side view of the sofa-bed of Figure 1 in closed position, i.e. in the day-time position; and
- Figure 3 shows a side view of the sofa-bed of Figure 1 during its opening or closing.

Referring to Figure 1, for the sake of a better clearness of explanation, the mechanism according to the present invention is first described in open position, i.e. in the night-time position. Furthermore, owing to the horizontal symmetry of such a mechanism, the drawing obviously shows only one member of each pair of lever systems symmetrically arranged on either side of the mechanism. The present mechanism comprises, in a known way, a parallelepiped-shaped bottom framework 1, which rests on the ground on four feet 2. The four sides of such a base are preferably closed by padded walls which cover the mechanism according to the present invention, the drawing showing only front wall 3 and rear wall 4, possibly higher than base 1. The two front posts of base 1 are supported by two shafts 5 slanted of about 45°.

A pair of downwardly projecting brackets 6 is fastened at about a third of the distance between the rear side and the front side of base 1. The lower end of each bracket 6 has pivoted thereon a lever system A of a known type for lifting the rear end of rear section 7 of the bedspring supporting mattress 8. Such a known lever system comprises a lower lever 9 having an end pivoted on a bracket 6 and the other end hinged to an end of an upper lever 10. The other end of upper lever 10 is provided with an eyelet 11 wherein a pivot 12, integral with rear section 7 of the bedspring, may slide and rotate with a short stroke. For the sake of explanation clearness, the points where two or more members of the mechanism according to the present invention are mutually pivoted will be hereinafter indicated by the reference numbers of such members, separated by a hyphen. Point 9-10 has further pivoted thereon an end of a shaft 13 for the transmission of the motion between one of the two lever systems A for lifting the rear portion of rear section 7 of the bedspring and one of the two lever systems B for lifting its front portion. Such a transmission shaft, when shifted towards the rear and lower portion of the mechanism according to the present invention, causes lever 9 to rotate downwards, resulting in the folding of lever 10 thereon and in the lowering into base 1 of bedspring rear section 7.

Both lever systems B comprise two almost parallel lifting levers 14 and 15, which are pivoted on base 1. In

particular, lever 14 has a short length bent of about 130° and is hinged, in proximity to such an angle, to the center of a supporting shaft 5 of base 1. The lower end of lever 14 is connected, through a tension spring 16, to the lower portion of base 1, while its upper end is hinged to the end of a connection shaft 17. The lower end of lifting lever 15 is instead pivoted on the upper end of supporting shaft 5 of base 1, while its upper end is pivoted between the two ends of connection shaft 17. Therefore, spring 16, by acting on the quadrilateral formed by levers 14, 15 and shafts 5, 17, urges levers 14, 15 to rotate upwards and shaft 17 to shift along an axis substantially parallel to shaft 5, i.e. slanted of 45° towards the front and upper portion of the present mechanism. Such an action is useful for reducing the force which is necessary to lift the bedspring during its opening.

Each lever system B further comprises two other connection shafts 18 and 19, pivoted to each other at one end. The loose end of shaft 18 is pivoted between the ends of lifting lever 15, while lever 14 and shaft 17 are pivoted between the ends of shaft 19, both in point 14-17. The distance between point 18-19 and point 14-17-19 is about a third of the length of shaft 19. The end of transmission shaft 13, opposite to point 9-10-13, is instead pivoted at about two thirds of the length of shaft 19 from point 18-19. Thanks to shaft 13 and to the quadrilateral formed by levers 14, 15 and shafts 18,19, it is possible to control the motion of lever systems A depending upon the motion of the respective lever systems B, and vice-versa.

The end of shaft 19, opposite to point 18-19, is pivoted on the end of shaft 20, acting so as to control the relative rotation of rear section 7 and a first connecting section 21 of the bedspring, which are hinged to each other. For this purpose, the end of control shaft 20 opposite to point 19-20, is pivoted on the end of first connecting section 21, opposite to point 7-21. By this arrangement, lever systems B, during the lifting of rear section 7, automatically extend section 21, and vice-versa.

Point 20-21 ofthe first connecting section 21 has hinged thereto a bedspring intermediate section 22, which is approximately as long as rear section 7, while connecting section 21 is approximately as long as a third of rear section 7. The relative rotation of sections 21 and 22 is also controlled by lever systems B. For this purpose each side of intermediate section 22 has welded thereon a bracket 23 (shown in Figure 3) which protrudes towards section 21. The outer end of such a bracket has suitably pivoted thereon the end of connection shaft 17, opposite to point 14-17-19. Thanks to this connection, lever systems B, during the extension of connecting section 21, automatically extend also section 22, and vice-versa. Figure 1 shows bedspring sections 7, 21 and 22 in the extended position, i.e. mutually aligned.

In order to make the extension of such sections easier, during the opening of the mechanism according to the present invention, each lever system B is provided with a tension spring 24 having an end fastened to the upper portion of base 1 and the other end connected, through a bracket 25, to the corner of a lever 26, bent of 100°-110° at about a third of its length. An end of such a lever is pivoted on point 17-23, having as well pivoted thereon connection shaft 17 and bracket 23 integral with intermediate section 22. The other end of lever 26 is pivoted on a side of rear section 7 near point 7-21, where this section is hinged to connecting section 21. During the opening of the bedspring, spring 24 urges lever 26 to rotate around fulcrum 7-26, so as to rotate also sections 21 and 22 around point 7-21.

The working of lever systems B, and accordingly of lever systems A, is controlled by a pair of control levers 27, preferably bent of 25°-35° in several points, so that the overall inclination between their end lengths is 100°-110°. Such control levers are mutually connected through a transversal bar (not shown in the drawing) welded thereon in proximity to one of their ends 28, capable of resting on the ground. The other end of levers 27 is instead pivoted approximately at the center of the sides of first connecting section 21 of the bedspring. At about a third of the length of each lever 27 from end 28, a short longitudinal eyelet 28 is provided, wherein a pivot 30 may slide and rotate, fastened to the end of a lever 31 belonging to one of two lever systems C.

These lever systems act so as to release the mechanism according to the present invention from the folded position, simply by acting on back 32. For this purpose, both lever systems C comprise an angular support 33, fastened to one of the sides of back 32 and to a shaft being part of a pantograph, formed, besides shaft 34, also by lever 31, three other shafts 35, 36, 37 and another lever 38. When the bedspring is extended, this pantograph is also extended, so that back 32 lies in an almost horizontal position under intermediate section 22 of the bedspring. In this position, seat 39 of the sofa-bed or chair-bed, which is fastened to section 22 so as to lie above or under such section 22 whether the bedspring is extended or folded, respectively, is arranged between section 22 and back 32.

Point 31-38, having pivoted thereon an end of the aforementioned pantograph being part of lever system C, has also pivoted thereon an end of a transmission lever 40 which belongs to one of two lever systems D, acting so as to extend the last two sections 41 and 42 of the bedspring. Such an extension is performed by acting onto a pair of legs 43, having one end pivoted on one side of front section 42 of the bedspring and the other end 44 capable of resting on the ground. A connection lever 45, bent of about 100°-110°, is pivoted near point 42-43. Lever 45 is pivoted at this corner on the second connecting section 41 of the bedspring, while the free end of the same lever is pivoted on the free end of transmission lever 40. It is thus evident that, by rotating legs 43 downwards, bedspring sections 22, 41 and 42 are extended, and vice-versa. Front section

42 of the bedspring, as well as its rear section 7, are preferably provided with edges 46 for containing mattress 8.

Referring now to Figure 2, the bedspring of the mechanism according to the present invention is folded under seat 39 in the day-time position. Front section 42 of such a bedspring is arranged horizontally between intermediate section 22, placed above it, and rear section 7, placed under it, while connecting sections 21 and 41 are arranged vertically. Figure 2 does not show mattress 8, which is compressed between the folded sections of the bedspring. However, the expansion force exerted by compressed mattress 8 against the bedspring sections does not result in the opening of the bedspring, since the control lever systems C, blocked in a position opposing such a force, prevent lifting levers A and B from moving, so as to block the whole mechanism according to the present invention. Lever systems C are released by moving back 32 forward, so that levers 31 pass the dead-point represented by their substantial alignment with bedspring intermediate section 22. Once this dead-point is passed, lever systems C are free to move and no longer oppose the opening motion of the mechanism according to the present invention. Furthermore, such an opening is made easier by the action of springs 16 and 24, which, by acting on lever systems B, urge bedspring sections 7, 21 and 22 to extend.

Referring now to Figure 3, during the opening of the mechanism according to the present invention, back 32 is moved forward and folded against seat 39, so as to extend the pantograph of lever systems C formed by shaft 34, 35, 36, 37 and 38 and by lever 31. By this way control levers 27 rotate forward and their ends 28 are available to the user's hold. The forward rotation of levers 27 further results in the opening of the angle formed by section 21 and 22, gradually increasing from 90° to 180°.

The relative motion of section 21 and 22 is transmitted through shafts 17 and 20 to lever systems B, which lift the front portion of rear section 7 of the bedspring due to the upward rotation of the pairs of levers 14 and 15, pivoted on shafts 17 and connected to shafts 20 through shafts 18 and 19. The forward rotation of shafts 18 further results in the forward shift of shafts 13, so that the motion of lever systems B is transmitted to lever systems A. These latter lift the rear portion of rear section 7 of the bedspring due to the upward rotation of the pairs of levers 9 and 10.

The motion of lever systems B further results in the increasing of the angle formed by sections 7 and 21, which as well gradually increases from 90° to 180°, also thanks to the mechanical connection between rear section 7 and intermediate section 22 provided by lever 26.

Referring now again to Figure 1, the complete opening of sections 7, 21 and 22 of the bedspring of the mechanism according to the present invention is performed by pulling downwards control levers 27 until their ends 28 touch the ground. This movement completes the relative rotation of such sections and in particular the lifting of rear section 7, so that, at the end of the motion of lever systems A, B and C, bedspring sections 7, 21 and 22 are horizontally lifted from the ground, while seat 39 and back 32 are arranged under intermediate section 22 of the bedspring.

At this time, the bedspring is completely extended by rotating downwards legs 43 of lever systems D until their ends 44 touch the ground. Such a rotation is transmitted by levers 40 and 45 to bedspring sections 41 and 42, so that both the angle between sections 22 and 41 and the angle between sections 41 and 42 gradually increases from 90° to 180°.

In order to close the mechanism according to the present invention, it is sufficient to perform the aforementioned operation backwards, so that bedspring sections 7, 21, 22, 42 and 44, while being folded under seat 39, fold and compress mattress 8.

In other embodiments of the mechanism according to the present invention, the bedspring may be obviously sized so as to support two or more mattresses side by side. Likewise, other embodiments of the mechanism according to the present invention may obviously comprise two or more bedsprings which are extendible independently from one another by means of lever systems of the aforementioned type.

Claims

1. A mechanism for sofa-beds and the like comprising at least a back (32) and a seat (39), said mechanism comprising at least a bedspring which is capable of supporting at least a mattress (8), is divided into several sections (7, 21, 22, 41 and 42) hinged to one another and is foldable under said seat (39), characterized in that it comprises a plurality of lever systems (A, B and C) capable of lifting and extending such a bedspring, as well as folding the seat (39) and the back (32) under at least one of said sections (22) of the bedspring.

2. A mechanism according to the previous claim, characterized in that the bedspring comprises at least a front section (42), an intermediate section (22) and a rear section (7) hinged two by two through connecting sections (21, 41).

3. A mechanism according to the previous claim, characterized in that, when the bedspring is folded under the seat (39), the relating front section (42) lies under the intermediate section (22) and above the rear section (7), said sections (7, 22 and 42) being arranged in a substantially horizontal position.

4. A mechanism according to claim 2 or 3, characterized in that, when the bedspring is folded under the seat (39), the connecting sections (21, 41) are ar-

ranged in a substantially vertical position.

5. A mechanism according to one of the previous claims, characterized in that, when the bedspring is folded under the seat (39), the mattress (8) supported by such a bedspring is folded and compressed between the sections (7, 21, 22, 41 and 42) of the bedspring itself.

6. A mechanism according to one of the previous claims, characterized in that it comprises a base (1) having pivoted thereon the levers (9, 14 and 15) of the lever systems (A, B) which lift and extend the rear section (7) of the bedspring.

7. A mechanism according to the previous claim, characterized in that at least one (B) of the lever systems (A, B and C) lifting and extending the bedspring comprises two lifting levers (14, 15) pivoted on the base (1) and on a connection shaft (17), which is in turn pivoted on the intermediate section (22) of the bedspring.

8. A mechanism according to the previous claim, characterized in that it comprises a tension spring (16) having an end fastened to the base (1) and the other end fastened to one (14) of the lifting levers (14, 15).

9. A mechanism according to claim 7 or 8, characterized in that at least one (B) of the lever systems (A, B and C) lifting and extending the bedspring comprises two other connection shafts (18, 19) pivoted on each other, wherein one of such connection shafts (18) is further pivoted between the ends of one (15) of the lifting levers (14, 15), while the other connecting shaft (19) is pivoted on a control shaft (20) further pivoted on the connecting section (21) hinged to the rear section (7) and to the intermediate section (22) of the bedspring.

10. A mechanism according to the previous claim, characterized in that a point of the connection shaft (19) pivoted on the control shaft (20) has pivoted thereon both the lifting lever (14) connected to the tension spring (16) and the connection shaft (17) pivoted on the intermediate section (22) of the bedspring.

11. A mechanism according to one of the previous claims, characterized in that the rear section (7) of the bedspring has pivoted thereon at least a lever (26) bent in at least a point, which is pivoted on the intermediate section (22) of the bedspring and is pulled towards the base (1) of the mechanism by a spring (24).

12. A mechanism according to one of the previous claims, characterized in that the lever systems (A, B) lifting and extending the rear section (7) of the bedspring are mutually connected through a motion transmission shaft (13).

13. A mechanism according to one of the previous claims, characterized in that at least one (C) of the lever systems (A, B and C) lifting and extending the bedspring comprises a pantograph (31, 34, 35, 36, 37 and 38) having at one end two levers (31, 38) pivoted to the intermediate section (22) of the bedspring and at the other end a shaft (34) fastened to the back (32).

14. A mechanism according to the previous claim, characterized in that it comprises at least a control lever (27) for extending the bedspring which is pivoted on the connecting section (21) hinged to the rear section (7) and to the intermediate section (22) of the bedspring, and comprises a longitudinal eyelet (29) wherein a pivot (30) may slide and rotate, fastened to the lever (31) of such a pantograph (31, 34, 35, 36, 37 and 38) pivoted on the intermediate section (22) of the bedspring.

15. A mechanism according to the previous claim, characterized in that, when such pantograph (31, 34, 35, 36, 37 and 38) is compressed, the control lever (27) prevents the relative rotation of the rear section (7) and the intermediate section (22) of the bedspring.

16. A mechanism according to the previous claim, characterized in that an end (28) of the control lever (27) rests on the ground when the bedspring is extended.

17. A mechanism according to one of the previous claims, characterized in that it comprises at least a lever system (D) for extending the front section (42) of the bedspring, which comprises a transmission lever (40), a connection lever (45) and a leg (44) pivoted on one another and pivoted to the intermediate section (22), to a connecting section (41) and to the front section (42) of the bedspring.

18. A sofa-bed characterized in that it comprises at least a mechanism according to one of the previous claims.

19. A chair-bed characterized in that it comprises at least a mechanism according to one of claims 1 to 17.

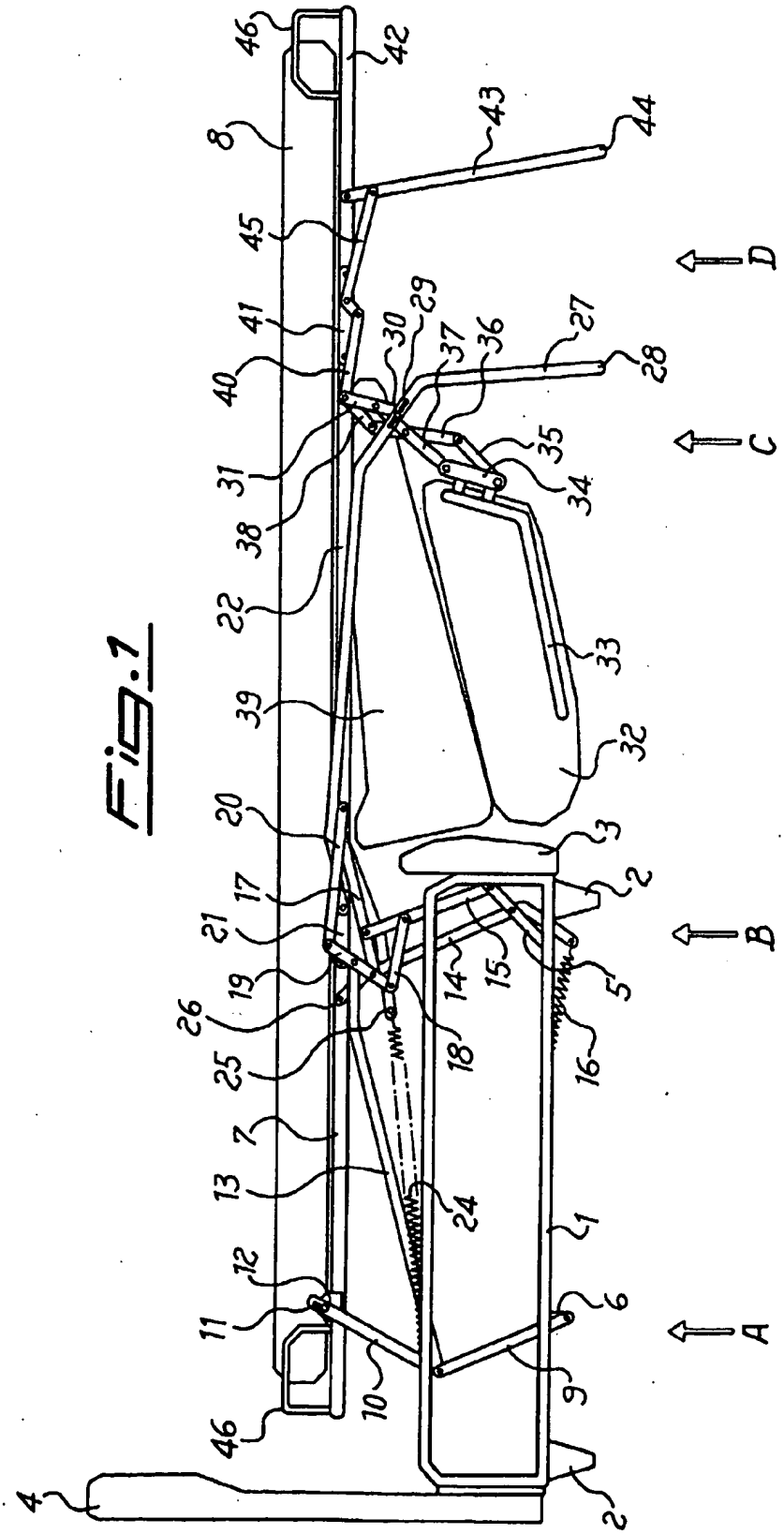
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Fig.1

Fig.2

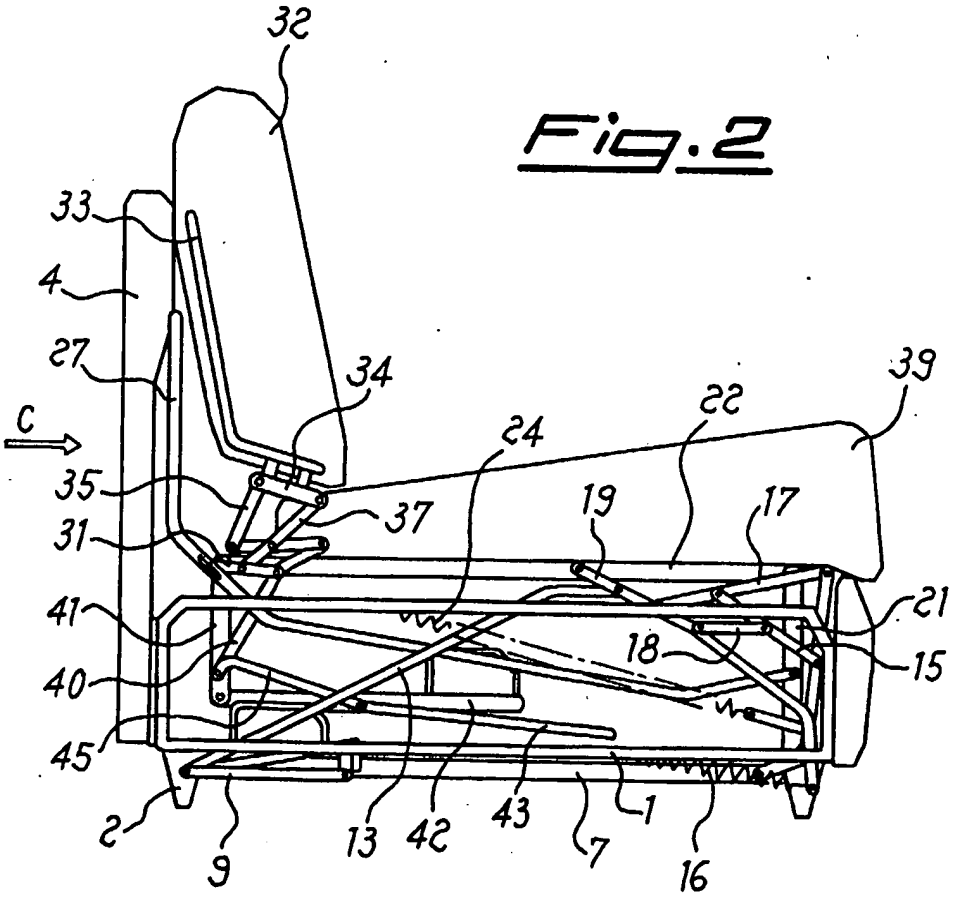
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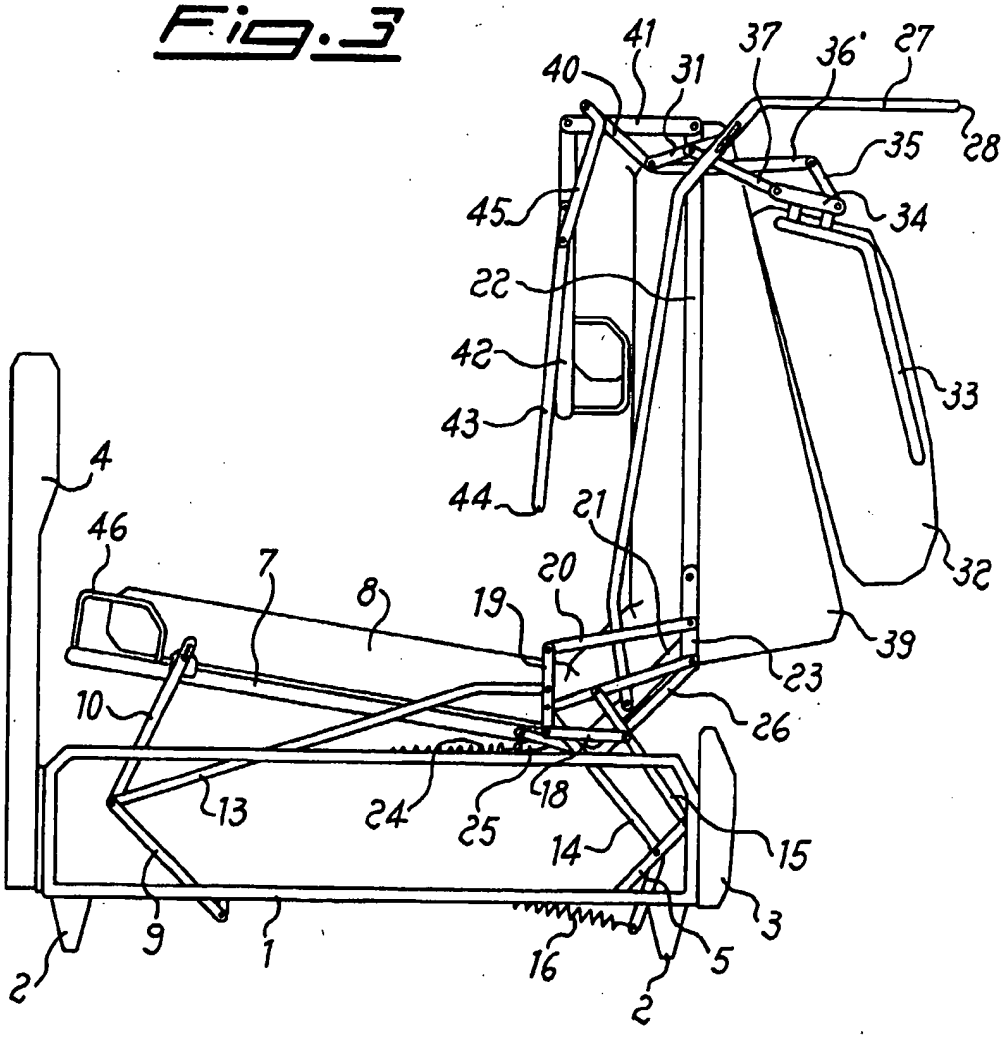
Fig.3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